

November 27, 2001

Mr. Mike Richardson
Project Manager
Cape Environmental Management Inc.
2302 Parklake Drive Suite 200
Atlanta, Georgia 30345-2907

SUBJECT: Ground Penetrating Radar (GPR) Survey, 607 Hardesty, Kansas City, Missouri, GSA Parking Lot Around Buildings 3 and 3A.

Dear Mr. Richardson:

A GPR survey was conducted on November 14, 2001, at the asphalt drive and parking lot of the GSA owned buildings near the intersection of Independence Road and Hardesty Street (607 Hardesty) Kansas City, Missouri. See Figure 1. The purpose of the survey was to determine if abandoned Underground Storage Tanks (USTs) were present that could cause groundwater and soil contamination. Historic and "as built" maps of the site indicated old USTs may be present. No USTs were located during this survey. The parking lot and drive surveyed covers approximately 15,000 square feet. The GPR unit used for this investigation incorporates a system that measures the time in nanoseconds that a radio frequency signal takes to go into the ground and return to the unit. Since soil and objects have different densities, the travel time a signal requires to leave the antenna of the unit and return also varies and is displayed on an oscilloscope. Depth is also measured for buried items of the same density, since a signal to the lower part of an object will take longer to return to the unit than a signal to the upper part of the same object. The time difference can be estimated as depth below the surface. The GPR unit transmits a conical signal into the ground and the signal's return displays a vertical view of buried objects, soil, groundwater or bedrock. Depth to an object can only be estimated using GPR. This is because the subsurface is not just one material. For example, concrete, asphalt, sand and clay soils have different densities and the signal to an object in or under several different surface or subsurface layers will be effected by each layer as it passes through it. An estimate of the depth to an object can be made using an average of the travel time of the signal through the various layers to and from the object. This average travel time for various materials has been predetermined and is available as part of the operating instructions for the GPR unit.

The survey was completed on two separate days because The GPR Unit's computer failed to "boot up" on the first day after surveying the entire 15,000 square feet but prior to a second confirmation survey of the specific areas suspected to contain the USTs. After corrections to the GPR software were completed back at the GBA offices, the survey was completed on November 21, 2001.

There were no locations where USTs or possible USTs were detected. See Figure 2 and photo frames 1, 2 and 3. Two locations by buildings 3 and 3A were suspected as containing abandoned underground tanks. Photos 1 is of the suspected UST location on the southwest corner of building 3 and photos 2 and 3 of the suspected location on the northeast corner of building 3A. The radar target did not reflect a definite image of the an UST at any location. At the possible UST location by Building 3A a fill port is located above grade. The GPR detected no UST in this area. It is suspected that the fill port was used to pipe diesel fuel into building 3A where piping is visible running down into a basement level inside the building to an area where diesel storage tanks had been once located. The fill port may have been abandoned in favor of using a newer, more accessible fill port which is located in line with the old one and is attached to the side of building 3A near where vent piping from the removed basement diesel tanks come to the surface. See Photo frame 3. A possible but less likely scenario is that the UST is in place, filled with soil and rusted to the point where the radar image cannot see the separation of the soil in the tank and surrounding soil. A tree is growing up through the fill port and thus soil is available below the fill port to permit the growth of the tree. See photo 3. A Radiodetection RD 400SL locator, set in both the radio and passive modes was used in an attempt to confirm the presents of metal USTs at their suspected locations. The result of this investigation was inconclusive because of the depth to the suspected USTs and a mix of strong interfering electrical signals in the area surveyed. An object that appeared to be a electrical main was detected at the southwest corner of the survey. See Figure 2. and photo frame 4. There were no other buried objects detected during the survey that appeared to be USTs or liquid containers.

The weather on both survey days was warm and sunny and no moisture hindered the survey. A Geophysical Survey Systems Inc. Sir 2 GPR unit was used to conduct the survey. A 500 MHz antenna was used to cover the site using a ten-foot-square grid pattern, where possible. A two foot grid was used to survey around the areas where the two suspected abandoned USTs were located. The GPR unit was set in the 500S automatic mode, dielectric constant at 5, measuring to the 60 nanosecond range. Objects to a depth of 4 meters (13.12 feet) can be detected with these settings and 500 MHZ antenna. Soil conditions at this particular site were such that GPR signals were distinguishable to approximately 12 feet. The GPR unit gain was set up in the manual mode and adjusted as the survey progressed to produce sufficient signal strength for a proper radar return for the type of soil, dry clay, prevalent at this site.

We appreciate you choosing George Butler Associates Inc. for this project. If you have any questions please call me at (913) 577-8422. An invoice for this project is enclosed.

Sincerely,

GEORGE BUTLER ASSOCIATES, INC.

Ken Kolthoff
Environmental Coordinator

cc: File 9712
Enclosures
M:\proj\9712\gprptcape.wpd

GROUND PENETRATING RADAR SURVEY

**GSA SITE, BUILDINGS 3 AND 3A
PARKING LOT/DRIVE
(607 HARDESTY)
NEAR INTERSECTION OF INDEPENDENCE AND HARDESTY
KANSAS CITY, MISSOURI**

Prepared for

CAPE ENVIRONMENTAL MANAGEMENT INC.

Prepared by

George Butler Associates, Inc.

November 2001